IDAHO DEPARTMENT OF HEALTH & WELFARE

Disease Bulletin

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Gastrointestinal Illness Among Rafters of the Middle Fork of the Salmon River

The Middle Fork of the Salmon River, in the remote region of Frank Church Wilderness of No Return, Idaho, was the location of an outbreak of gastroenteritis among river rafters during July–August 2013. Approximately 10,000 persons raft this 104-mile stretch of river annually on 4–10-day trips without road access.[1] During July–August 2013, a total of 7,399 persons rafted the river under permit from the U.S. Forest Service (USFS).[2]

On July 24, emergency services personnel notified Eastern Idaho Public Health District (EIPHD) that five rafters were transported by ambulance from a river take-out site to a hospital for treatment of nausea, vomiting, diarrhea, stomach cramping, and dehydration. Upon contacting the hospital, EIPHD epidemiologists learned that the patients had been treated and discharged; no clinical samples for laboratory testing were collected because the patients were unable to produce stool. EIPHD verified continued illness among river rafters with the help of USFS river checkpoint personnel through August 6, when the checkpoint closed because of a mudslide.

During the outbreak, EIPHD requested that clinics and hospital emergency departments contact EIPHD regarding patients who presented with symptoms of gastroenteritis after rafting the Middle Fork and provided stool sample kits for submission of specimens to the Idaho Bureau of Laboratories (IBL) for testing by culture, immunoassay, direct immunofluorescence antibody assay, and reverse-transcription-polymerase chain reaction. Environmental samples were collected at locations along the river for testing.

A case-control study was conducted by the EIPHD and the Bureau of Communicable Disease Control of the Idaho Department of Health and Welfare (IDHW) to identify the etiologic agent, source, and risk factors for illness. We solicited participants among persons rafting the Middle Fork after July 1 through the media, in person, and by sending e-mail to rafting permit holders. We provided an online questionnaire August 7–October 22 regarding symptoms, meals, drinking water, and environmental exposures. A case was defined as nausea, vomiting, or diarrhea ≤25 days after rafting (maximum incubation period for giardiasis) in a person who had rafted July 1–September 23. Control subjects were well persons who had rafted July 1–September 23. The epidemic curve (Figure) indicates a propagated source of transmission.

A total of 102 case-patients and 293 control subjects were included in the case-control study. Study participants' ages ranged from 10 to 85 years. The proportion of female sex and mean age did not differ significantly between case-patients (32 [31.4%] female; mean age: 45.5 years) and control subjects (121 [41.3%] female; mean age: 49.7 years (P value = 0.08 and P value = 0.06, respectively).

Among the 102 case-patients, 75 (73.5%) had nausea; 51 (50%) had vomiting; and 80 (78.4%) had diarrhea. Median symptom duration was 2 days (range: 1–49 days). No association was identified between illness and exposure to hot springs; meals before, during, and after the trip; spigot or toilet use along the river; or group size. Sixty-nine (39.4%) of 175 rafters became ill after drinking filtered river water. Illness was associated with drinking filtered river water (odds ratio [OR]: 3.9; 95% confidence interval [CI]: 2.4–6.4). We later

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defined norovirus-like gastroenteritis cases (n = 63) as illness duration ≤3 days, and giardia-like gastroenteritis cases (n = 38) as illness duration ≥4 days, after receipt of laboratory results (discussed below). The association between illness and drinking filtered river water was stronger among norovirus-like gastroenteritis cases (OR: 6.6; 95% CI: 3.3–12.9) than giardia-like gastroenteritis cases (OR: 2.2; 95% CI: 1.1–4.3). In March 2014, we initiated a follow-up online survey about water treatment methods used; results are pending.

Twenty-three (22.5%) case-patients reported seeking medical attention; of these, 13 (56.6%) persons reported having had clinical specimens submitted for laboratory testing. Results available from 11 ill rafters indicated that norovirus (n = 3) and giardia (n = 8) were detected in clinical specimens. Norovirus was detected on water spigots and outhouses; *Escherichia coli* was detected in an unregulated water source.

This multiple-etiology outbreak was likely propagated through environmental contamination and apparently associated with drinking filtered river water. Strict adherence among river rafters to disseminated guidelines for gastrointestinal illness prevention, including sanitation, food handling, and water treatment, was advised.[3] Medical consultants are encouraged to refer rafters to these guidelines and advise those going on extended wilderness trips to include oral rehydration salts, bismuth subsalicylate, and other antidiarrheal medications (*e.g.*, loperamide, diphenoxylate, or paregoric) in trip medical kits, with instructions for use.

To help identify and control recreational water-associated outbreaks, health care providers are encouraged to collect clinical specimens from patients with gastroenteritis who have recently participated in a recreational water activity, particularly when multiple patients present with a similar exposure. Vomitus is an acceptable specimen for testing for norovirus if stool samples are unobtainable[4] or if chemical or biologic toxins are suspected.[5,6] Specimens from patients suspected of having outbreak-associated illness can be tested by IBL at no cost if prior arrangements are made with staff in one of the Public Health Districts. (www.healthandwelfare.idaho.gov/?TabId=97). Suspected cases of waterborne illness must be reported to IDHW or a Public Health District within one working day of identification (IDAPA 16.02.10). The American College of Preventive Medicine sponsors free CME and MOC credits on recognizing waterborne disease and the health effects of water pollution at www.waterhealthconnection.org/.

References

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[2]Source: U.S. Forest Service [*FOIA Officer – Julieann Frederick, 11/15/2014 email communication*]

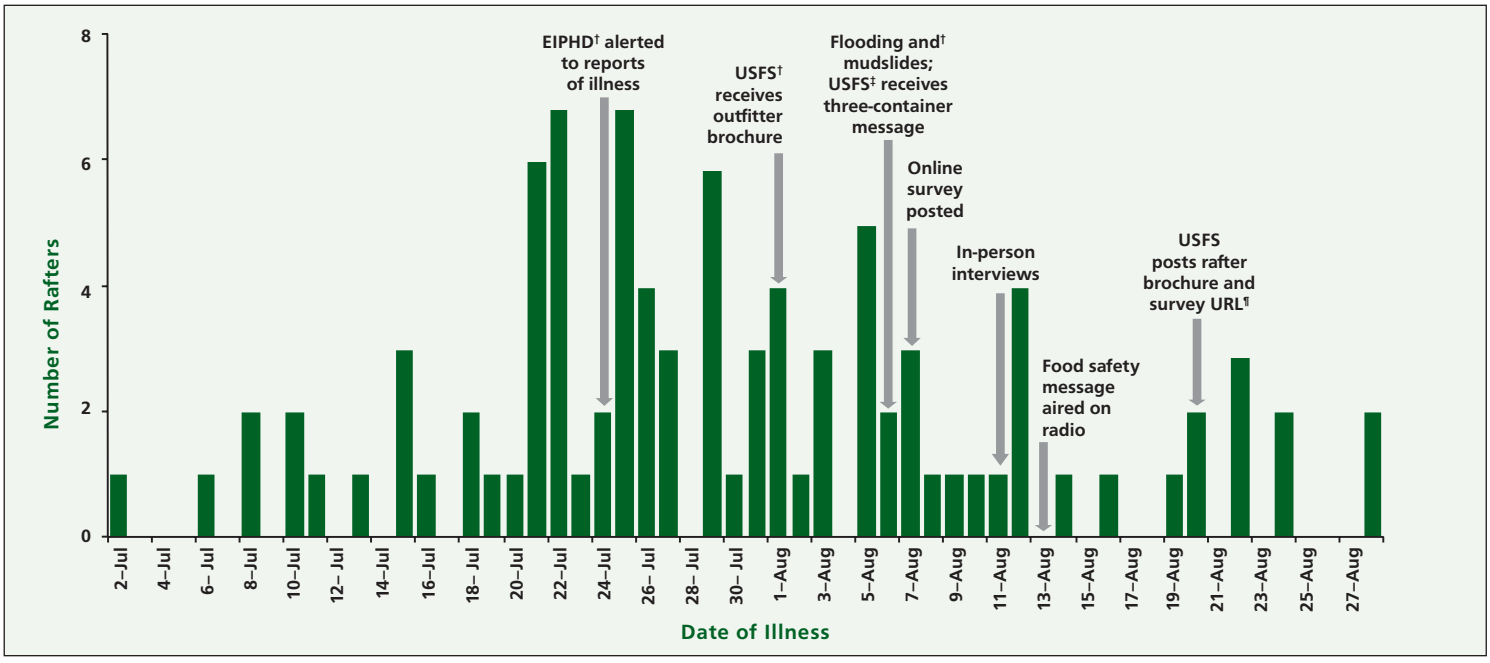
[3]Idaho Department of Health and Welfare. www.healthandwelfare.idaho.gov/Portals/0/Health/FoodProtection/CleaningDishes.pdf; www.healthandwelfare.idaho.gov/Portals/0/Health/Epi/Waterborne/RiverRaftingSafetyWeb_FINAL.pdf. Accessed March 21, 2014.

[4]Centers for Disease Control and Prevention (CDC). Norovirus: specimen collection. www.cdc.gov/norovirus/lab-testing/collection.html. Accessed March 21, 2014.

[5]World Health Organization (WHO). Foodborne disease outbreaks: guidelines for investigation and control. Available at: www.who.int/foodsafety/publications/foodborne_disease/outbreak_guidelines.pdf. Published: 2008. Accessed March 21, 2014.

[6]International Association of Milk, Food, and Environmental Sanitarians, Inc. *Procedures to Investigate Waterborne Illness.* 2nd ed. Des Moines, IA: International Association for Food Protection;1996.

Figure. Dates of illness onset reported by rafters of the Middle Fork of the Salmon River, Idaho—2013 (n = 95*)



Abbreviations: EIPHD, Eastern Idaho Public Health District; USFS, U.S. Forest Service; URL, uniform resource locator.

* Illness onset date was unavailable for 7 case-patients.

† *Prevent Foodborne and Waterborne Illness: Recommendations for Idaho River Outfitters* at www.healthandwelfare.idaho.gov/Portals/0/Health/Epi/River%20Raft%20Brochure_FINAL_Updated_20130801.pdf

‡ The three-container method is a technique used to clean and sanitize dishes when automatic dishwashing equipment is unavailable. See "A Quick Reference for River Rafters: Cleaning and Sanitizing Dishes Using the Three-Container Method" at www.healthandwelfare.idaho.gov/Portals/0/Health/FoodProtection/CleaningDishes.pdf

§ *A Closer Look At Your Health: Food handling on a river trip.* Transcript of podcast available at www.healthandwelfare.idaho.gov/Portals/0/Health/FoodProtection/0813_RiverFoodTips.pdf

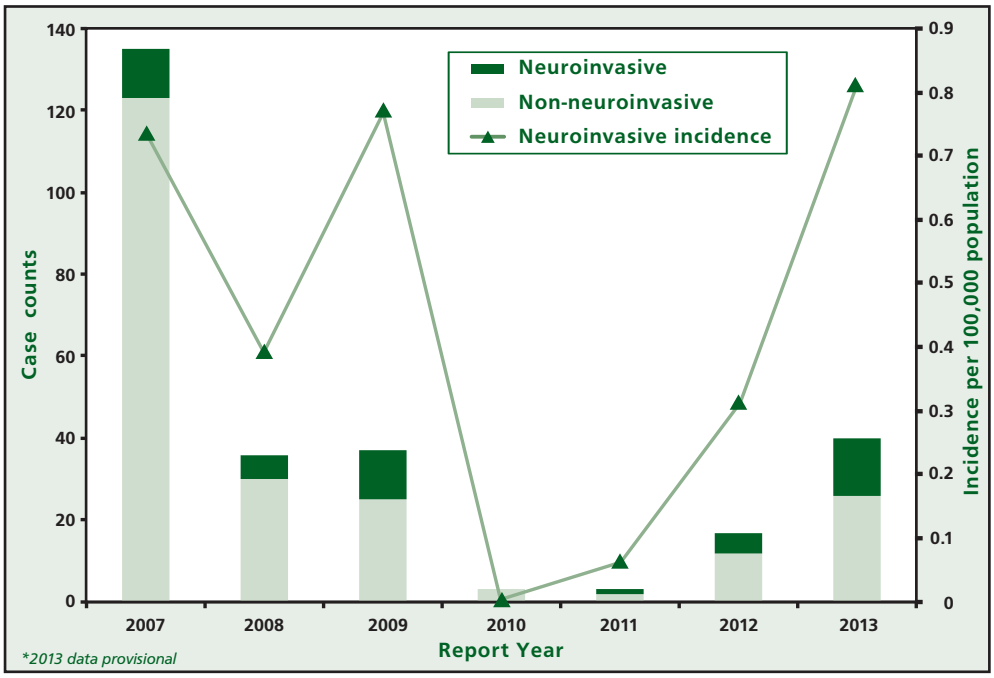
¶ Running the River (without getting the runs): How to Prevent and Control Vomiting and Diarrheal Illness on River Rafting Trips. See www.healthandwelfare.idaho.gov/Portals/0/Health/Epi/Waterborne/RiverRaftingSafetyWeb_FINAL.pdf

West Nile Virus Neuroinvasive Disease Reports: important predictors of incidence

The incidence of reported West Nile virus (WNV) neuroinvasive disease in Idaho has been increasing since a nadir in 2010 (Figure). Reported WNV neuroinvasive disease is a more reliable indicator of WNV activity than non-neuroinvasive disease reports because persons with neuroinvasive disease (*i.e.*, encephalitis, meningitis, meningoencephalitis, acute flaccid paralysis, or other acute signs of central or peripheral neurologic dysfunction) are more likely to seek medical attention and be tested for WNV than those with non-neuroinvasive disease (*e.g.*, febrile illness). Published estimates of the number of WNV infections and WNV non-neuroinvasive cases per reported WNV neuroinvasive case range from 140 to 353, and 30 to 70, respectively.[1] During 2013 in Idaho, 14 WNV neuroinvasive cases and 26 non-neuroinvasive cases were reported. Using the published ratios, we estimate 420–980 non-neuroinvasive cases and 1,960–4,942 total WNV infections occurred in 2013. To improve our understanding of the epidemiology of WNV and other locally-acquired arboviral infections in Idaho, healthcare providers are encouraged to submit CSF from suspected cases of arboviral neuroinvasive disease to the Idaho Bureau of Laboratories (IBL) for WNV and St Louis encephalitis virus testing. If CSF specimens test negative for these two viruses, IBL will forward the specimens to Centers for Disease Control and Prevention for further arboviral testing. Testing is provided at no charge.

To learn more about WNV in Idaho visit: www.westnile.idaho.gov
To access the Idaho Bureau of Laboratories sampling and submission guide: www.healthandwelfare.idaho.gov/Health/Labs/SamplingandSubmissionGuide/tabid/2223/Default.aspx

Figure. Reported West Nile virus cases, by neuroinvasive status, and incidence of neuroinvasive disease—Idaho, 2007–2013*



References

[1]Personal communication, CDC

Proper Lyme Disease Testing Can Reduce Misclassification

Borrelia burgdorferi, the causative agent of Lyme disease (LD), is transmitted by infected *Ixodes* spp. ticks. The western blacklegged tick (*Ixodes pacificus)* is found along the Pacific Coast, with isolated populations in a few interior western states, but not Idaho[1]. Most LD cases coincide with the distribution of *I. scapularis*, blacklegged, or deer tick, found in the eastern United States.[2] All reported LD cases are required to be investigated, including determining if a tick exposure occurred while traveling, per the Idaho Reportable Disease Rules (IDAPA 16.02.10). During 2005–2012 in Idaho, an average of eight cases were reported annually (range, 2–16). Information about travel was documented in 52 (78%) of 66 of the reports. Of these 52 reports, travel to known areas of endemicity during the likely exposure period was noted in 37 (71%) and the remaining 15 had only noted travel within Idaho borders. Although the risk of indigenous exposure is not recognized in Idaho, possible reasons for this include: populations of *I. pacificus* remain undiscovered in Idaho, an unidentified competent vector lives in Idaho, an infected vector was present transiently
(a possibility with seasonal sheep movements into Idaho), the travel history did not adequately capture travel to areas of endemicity, or cases were misclassified as probable or confirmed cases according to public health surveillance definitions due to incomplete use of LD diagnostic tiered testing or tests that are not approved by U.S. Food and Drug Administration (FDA).

To avoid misdiagnosis, the Centers for Disease Control and Prevention (CDC) recommends that laboratory tests cleared or approved by FDA be used to aid in the routine diagnosis of LD. Commercial and research laboratories might offer culture and polymerase chain reaction (PCR), but these are not considered good first-line tests and should be avoided until they become FDA-approved. When laboratory testing is indicated, CDC recommends using two-tiered

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Idaho Disease Bulletin

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Division of Public Health
P.O. Box 83720
Boise, ID 83720-0036

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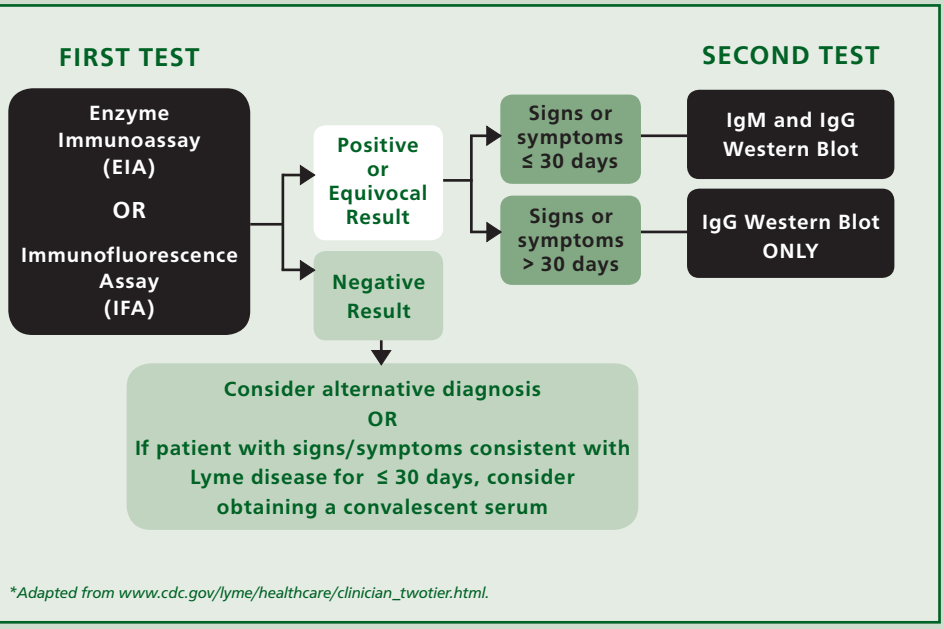
An electronic version of the Idaho Reportable Diseases Rules may be found at http://adminrules.idaho.gov/rules/current/16/0210.pdf.

Current and past issues are archived online at www.idb.dhw.idaho.gov.

LYME DISEASE CONTINUED FROM PAGE THREE

testing[3] (Figure) and restricting testing to individuals with a clinically compatible illness. The first test is an immunoassay EIA or IFA that can cross-react with antibodies against tick-borne relapsing fever (TBRF), which is endemic to Idaho and louse-borne relapsing fever, which is not endemic in Idaho. If results of the first test are equivocal or positive, the second test—IgM and/or IgG WB—is employed (Figure). There is no utility in testing EIA/IFA-negative samples by WB, and the WB run in the absence of first tier testing, can increase the frequency of false-positive findings. Of the 15 Idaho LD cases with a potential *Borrelia* exposure in Idaho, complete results of two-tiered LD testing were reported to the state for only 2 (13%); bringing into question the remaining case-reports.

Figure. Two-tiered testing for Lyme Disease.*



*Adapted from www.cdc.gov/lyme/healthcare/clinician_twotier.html.

Gathering a detailed travel history from reported human cases and only using two-tiered laboratory testing in clinically compatible individuals will reduce the likelihood that non-cases are reported. This and entomologic studies into the natural history of *Ixodes* in Idaho will contribute to the knowledge of *B. burgdorferi* risks within the state.

Concise information for clinicians on LD and other tickborne diseases can be found in Tickborne Diseases of the United States: A Reference Manual for Health Care Providers, Second Edition, 2014 (available at www.cdc.gov/lyme/resources/TickborneDiseases.pdf).

References

[1] Geographic distribution maps of ticks that cause disease in the contiguous United States. www.cdc.gov/ticks/geographic_distribution.html
[2] CDC Lyme Disease statistics www.cdc.gov/lyme/stats/maps/map2012.html
[3] Two-tiered testing approach www.cdc.gov/lyme/diagnosistesting/LabTest/TwoStep/